Process for Construction of Interfacial Material Capable of Manipulating Two-Dimensional Materials Without Causing Damage via Van der Waals Force

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Introduction

Given the variety of applications for two-dimensional materials, it is important both that we be able not only to construct these materials but that we be able to handle those materials without causing damage. Such thin materials are incredibly brittle and a method is required both for picking up and releasing the materials without causing damage. The key to achieving this is the Van der Waals Force.

Abstract

In order to construct an interfacial material capable of achieving this objective, free protons must be introduced to a thin material layer composed of a conductive metal through an epitaxy process in which protons are fired toward the material in the midst of LASER epitaxy.

The protons cause the material to become electrostatically attractive under standard conditions so long as the protons are electrically insulated and remain anionized. A shielded proton (encapsulated by C60) buried at an extremely shallow depth (half of the C60 buckyball would be peeking above the surface like a baseball embedded in a car windshield) in the interfacial material would bestow the needed property of electrostatic attraction. The electrostatic attraction does not need to be strong in order to lift a material so thin. Ordinarily, epitaxy is used when extremely smooth surfaces are desired, however, in this case, we want a material which is less than completely smooth but one in which any imperfections are gentle and sloping and for there to be no jagged edges which could introduce lacerations to the two-dimensional materials to be manipulated. Because C60 is incredibly smooth and because it is electrically insulating, it is ideal for this application. The reduced area of direct contact (direct contact being made only by the nodules of C60) makes it easier for separation to be achieved.

When the release of the materials is desired, a modest electrical impulse may be introduced to the conductive metal in order to repel the two-dimensional material which could be expected to easily release from the C60s.

Thus, there would first be the preparatory step of impregnating a bulk reserve of C60 molecules with protons using a proton gun prior to the actual epitaxy process and then one would have to perform the epitaxy of the conductive material as well as the already-manufactured buckyballs simultaneously. For this, two LASERs with two different frequency and power levels would be needed to vaporize both the conductive metal (most any conductive metal would work for this application) and the proton-infused buckyballs on their respective pallets so that they may precipitate in combination upon the

substrate appropriately, forming a series of nanoscopic tumuli on an otherwise smooth surface.

Conclusion

Naturally, the handling of two-dimensional materials and their accurate placement requires, in most cases, conditions of atmospheric vacuum as even the slightest breeze could corrupt the materials or cause a sheet to fall into the wrong position. When materials are picked up, the servo-mechanical mechanism used to do this must move extremely gradually and must be made to approach the material at a perfect head-on angle, which is, perhaps, more challenging from an engineering perspective than the process of creating the interfacial material. As two-dimensional sheets of varying dimension and shape would likely be called for, interfacial adapters of a variety of dimensions would be required in order to facilitate material transport in the context of building complex devices.